RADIO ONE
THE URBAN RADIO SPECIALIST

February 19, 2002

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C 20445

Re: *Digital Audio Broadcasting Systems and Their Impact on the Terrestrial Broadcast Service*
MM Docket No. 99-325

Dear Mr. Caton:

On behalf of Radio One, Inc. ("Radio One"), we are submitting these comments in response to the Commission's December 19, 2001 Public Notice in the above-referenced proceeding. In its Public Notice, the Commission requested comment on the National Radio Systems Committee's ("NRSC") recent evaluation of iBiquity Digital Corporation's ("iBiquity") FM IBOC system and the results of iBiquity's FM system tests. Radio One firmly believes that IBOC and the iBiquity system offer the best opportunity to foster terrestrial digital audio broadcasting in the United States.[1]

[1] Radio One is the nation's seventh largest radio broadcasting company and the largest primarily targeting African-American and urban listeners. Pro forma for all announced acquisitions and divestitures, Radio One owns and/or operates 65 radio stations located in 22 of the largest markets in the United States. Radio One is a minority shareholder in iBiquity Corporation. Radio One's President and Chief Executive Officer is a member of the board of directors of iBiquity.

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Our comments focus on two different topics. First, we would like to provide input to the Commission based on the participation of one of Radio One's stations, WWIN-FM, Glen Burnie, Maryland, in the field trials of the iBiquity system. In addition, we would like to comment to the Commission in support of increased flexibility by the Commission to address the problem of receiver-induced third order intermodulation, an approach we believe would significantly improve the overall quality of terrestrial broadcasting, digital and analog, in many urban markets.

Field Trial Participation

Radio One's experience with the IBOC system at WWIN-FM was uniformly positive. WWIN-FM is a Class A FM station operating at 3kW effective radiated power from a transmitter site located in Baltimore, Maryland. The test of the IBOC system at WWIN-FM began in the Fall of 2000 and is ongoing.

Implementation of digital broadcasting was accomplished without any major disruptions. The installation of the digital components of the exciter and low-level combiner at the WWIN-FM transmitter facility went very quickly and with no incident. There was little to no modification required of existing equipment using the method of digital and analog combination employed at the WWIN-FM transmitter facility.

One of the principal initial concerns was that of the effect of the digital component of the signal on the quality of the analog signal. Once the IBOC system was operational, there was no discernable difference in signal or audio quality before or after the digital hardware implementation. The function of the analog and digital system together was very

successful, and the test alleviated all concerns of the IBOC system interfering with the analog signal or analog audio quality.

Having been pleased with the results of both the implementation and operation with the existing analog carrier, we were anxious to see the actual benefit of the digital signal. WWIN-FM is short-spaced on several adjacent channels by Class B FM stations.[2] This type of boxing effect has a significantly adverse impact on the listenable coverage area. In evaluating the analog signal operating at 3 kW effective radiated power, the carrier would only be interference-free for approximately 10 miles in any direction toward one of the short-spaced facilities. In contrast, the digital component of the signal with an effective radiated power of only about 625 watts expanded the listenable contour from 10 miles for the analog coverage to 20 miles in any given direction for the digital coverage. These were phenomenal results and provided instant verification of the potential success and improvement of the WWIN-FM signal.

We believe that the NRSC report on iBiquity's FM IBOC system supports the Commission taking prompt action to endorse the IBOC system. The iBiquity system provides an opportunity for radio broadcasters to upgrade their analog systems to offer better sound quality, increased coverage area, and better resistance to multipath interference, potentially improving the ability of broadcasters to reach additional listeners in their service area who suffer from relatively poor analog reception. In addition, we believe the services that potentially could be offered to the public on a cost efficient basis through the iBiquity system's auxiliary data capabilities present another benefit which we expect

[2] WWIN is short-spaced towards WPGC-FM, Morningside, MD; WSOX, Red Lion, PA; and WHUR, Washington, D.C.

will become apparent as such services are developed over time. Because these benefits can be obtained without negatively impacting existing analog operations, implementing the system would be a win-win scenario for both broadcasters and the public.

Receiver-Induced Third Order Intermodulation (RITOI)

Our direct experience with the IBOC tests at WWIN-FM, combined with other encouraging results described in the NRSC report, leads us to believe that the proposed IBOC system will offer significant improvements over conventional FM in areas affected by multipath distortion as well as adjacent channel interference, and also will help to increase signal-to-noise ratio and preserve stereo separation in moderate-to-weak signal areas. The iBiquity system's ability to overcome many technical limitations of analog FM broadcast undoubtedly will raise the expectations of listeners. However, this also suggests that any *remaining* impairments to undistorted, seamless, full-market digital coverage will begin to stick out like the proverbial "sore thumb", perpetuating the competitive disadvantage between terrestrial and S-DARS [3] broadcasters.

Receiver-induced third order intermodulation (RITOI) is a form of continuous interference that often occurs near multiple-use broadcast antenna farms, affecting the reception of other local stations not located at such antenna farms. The Commission has been aware of the effects of RITOI for many years,[4] although the minimum distance separation tables in 47 CFR 73.207 and 47 CFR 73.215 offer no protection against this

[3] Satellite Digital Radio Audio Services, such as XM and Sirius.

[4] The RITOI effect was first observed and studied on a large scale in 1979 in the case of the "IDS Stations", which involved several FM facilities operating from a common site atop the IDS Building in downtown Minneapolis, MN.

form of interference, and its impact in each situation can be difficult to predict. Depending on distance, intervening terrain, and signal ratios, RITOI can impair reception to otherwise useable FM signals across an area greater than three miles in diameter.[5]

Because undesired RITOI products are generated as a result of overload to a receiver's "front end" -- the radio-frequency preamplifier and mixer stages -- and fall directly on the desired channel -- little, if anything, can be done in the subsequent intermediate frequency and demodulator stages of the receiver to eliminate this interference. Recent developments in digital signal processing, which can be effective in the process of rejecting adjacent-channel interference, are not an effective solution to RITOI because these techniques operate at the intermediate frequency and they do not address the overload in the receiver "front-end". Moreover, by its very nature, third-order intermodulation triples the apparent frequency deviation of interfering FM signals, spreading energy across a bandwidth of 450 kilohertz and affecting both the analog and digital portions of the IBOC signal.

It stands to reason that if a receiver cannot recover a satisfactory analog FM signal in the presence of RITOI, that receiver also would be unable to decode the IBOC digital component which is 20 dB weaker in strength. When confronted with RITOI interference, an IBOC receiver would "blend" to analog, but because the analog signal in these areas is so poor, the listener likely would tune out. Thus, IBOC will not offer any improvement in

[5] One of Radio One's Philadelphia market properties, WPLY(FM), currently experiences severe RITOI interference near the Roxboro antenna farm, where fifteen FM transmitters are co-located. The interference area, which falls about ten miles east of WPLY's transmitter, well within the predicted 70 dBu coverage contour, includes a six-mile segment of I-76, a major commuting route.

areas subject to RITOI. Prospects to solve this deficiency within the receiver itself appear doubtful. [6]

Clearly, the Commission needs to consider various means of reducing these RITOI problems, which affect a significant number of broadcasters. In past cases of RITOI, affected licensees and the Commission have learned that listener interference complaints can be minimized, or even eliminated, by co-locating the affected stations with the interfering stations. However, the ability to relocate FM transmitters is currently restricted by several sections of the FCC's rules, not to mention zoning considerations and economic factors.

To maximize the chance for success of IBOC digital radio, we strongly encourage the Commission to consider reasonable measures that would allow FM stations additional flexibility to relocate to more desirable sites within their existing markets, particularly antenna farms and master antennas.

One step the Commission should promptly consider that would increase the freedom for Class B and B1 stations to resolve RITOI problems would be to allow these stations to reclassify voluntarily as Class C2 and C3, respectively, within Zones I and I-A. Such a reclassification would not require any reduction in power, but would slightly reduce the radius of protection. Class B and Class B1 stations choosing to take this option would be

[6] In some cases, RITOI effects can be reduced at little expense by inserting a resistive attenuator ahead of the receiver's input, but this approach carries the disadvantage of degraded noise figure, in direct opposition to the requirement for high sensitivity, which is necessary to recover the digital component of the IBOC signal at just one-hundredth the power of the analog component.

Another means of reducing susceptibility to receiver-induced intermodulation, without great losses in sensitivity, requires a fairly selective bandpass filter, similar to a helical resonator. However, this peak response of the filter would need to track the tuning of the receiver closely, adding to the complexity of the receiver design. Such filters are bulky, and would add considerable expense because they cannot be designed emulated and replaced with integrated circuits.

protected to their 60 dBu contour, rather than to their 54 or 57 dBu contour, respectively, opening a possibility that co- or adjacent-channel facilities could someday make changes that would increase interference in "fringe" service areas. However, in our opinion, licensees are fully capable of evaluating their particular situations and deciding if such a tradeoff is acceptable. We believe that the public interest would be served by this provision, because it would allow stations to reduce interference problems within densely-populated urban areas of their markets, while reducing the need for waivers and allowing less restrictive directional patterns than currently required under the existing contour protection rules.

As an additional consideration, Class A stations, which often face a disadvantage covering urban markets because of their relatively low power, could also benefit from such a provision. In situations where a Class A facility is unable to relocate without becoming short-spaced to an adjacent Class B facility, the licensees of both stations could negotiate an agreement, whereby the Class B facility would be designated Class C2. This would then allow the Class A licensee additional flexibility to relocate to a new site better suited to overcome RITOI interference, without requiring the Class B station to reduce its power toward the Class A.

Conclusion

Based on the above, Radio One urges the Commission: (1) to endorse IBOC as the specific solution for terrestrial digital radio and endorse the iBiquity system; (2) to adopt a formal IBOC standard to encourage broadcasters, receiver manufacturers and consumers to upgrade to digital; and, (3) to use this opportunity to address the RITOI issue and proposed

solutions as described above. Taking each of these steps, we believe, will greatly support improved performance capabilities for terrestrial radio to the benefit of the public and radio broadcasters.

Respectfully submitted,

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